

Reply to Office Action of August 05, 2005  
Amendment Dated: November 4, 2005

Appl. No.: 09/976,004  
Attorney Docket No.: CSCO-010/4390

Listing of Claims

1        1 (Currently Amended): A method of setting up a plurality of virtual circuits between  
2        a first end system and a second end system, said plurality of virtual circuits being set up on  
3        a network connecting said first end system to said second end system, each of said plurality  
4        of virtual circuits terminating at said first end system and said second end system, said  
5        method being performed in a device between said first end system and said second end  
6        system, said method comprising:

7                sending to said second end system a first signaling message requesting said plurality  
8        of virtual circuits to be set up.

1        2 (Original): The method of claim 1, wherein said first signaling message comprises  
2        a plurality of information elements, wherein a first information element is designed to  
3        request set up of a single virtual circuit comprised in said plurality of virtual circuits, and  
4        a second information element is designed to request set up of a second plurality of virtual  
5        circuits comprised in said plurality of virtual circuits, further comprising:

6                receiving an acceptance message indicating that only said single virtual circuit is  
7        possible to be provisioned if any of a plurality of switches in a connection path between said  
8        first end system and said second end system is designed not to support said plurality of  
9        virtual circuits.

1        3 (Original): The method of claim 2, wherein said second information element  
2        comprises a non-mandatory information element according to a specification, wherein non-  
3        mandatory information elements can be ignored by said plurality of switches according to  
4        said specification.

1        4 (Original): The method of claim 3, wherein said specification comprises one of user  
2        to network interface (UNI) and network to network interface (NNI).

1        5 (Original): The method of claim 1, further comprising:

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2 receiving an acceptance message, said acceptance message indicating that a plurality  
3 of switches in a connection path between said first end system and said second end system  
4 have set up said plurality of virtual circuits.

1 6 (Original): The method of claim 5, wherein said plurality of switches accepts said  
2 plurality of virtual circuits but immediately provision fewer than said plurality of virtual  
3 circuits, said method further comprising:

4 sending a second signaling message to activate at least one of a plurality of not-yet-  
5 provisioned virtual circuits comprised in said plurality of virtual circuits.

1 7 (Original): The method of claim 6, wherein said fewer than said plurality of virtual  
2 circuits corresponds to one virtual circuit such that only one virtual circuit is provisioned in  
3 response to said first signaling message.

1 8 (Original): The method of claim 5, wherein said plurality of virtual circuits is  
2 treated as a group of virtual circuits, wherein said first end system and said second end  
3 system support a plurality of groups including said group, said method further comprising  
4 maintaining a bundle structure associated with each of said plurality of groups, wherein said  
5 bundle structure stores information identifying the specific plurality of virtual circuits  
6 forming the corresponding group.

1 9 (Original): The method of claim 8, further comprising:

2 maintaining a plurality of call reference structures, wherein each of said plurality of  
3 call reference structures maintains the state of a call, wherein signaling messages related to  
4 each group are received on a corresponding call; and

5 maintaining a plurality of per-VC structures, wherein each per-VC structure stores  
6 information related to a plurality of call parameters accepted for a corresponding one of said  
7 plurality of virtual circuits.

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1 10 (Original): The method of claim 9, wherein said sending, said receiving and each  
2 of said maintaining are performed in a switch contained in said connection path, said  
3 method further comprising:

4 maintaining a plurality of switch structures, wherein each of said plurality of switch  
5 structures stores a mapping of an identifier of each of said virtual circuit in inbound  
6 direction to another identifier of the virtual circuit in outbound direction;

7 mapping each identifier received in inbound direction to a corresponding identifier  
8 in outbound direction using said plurality of switch structures.

1 11 (Original): The method of claim 9, wherein said first end system comprises an  
2 edge router and wherein said method is performed in said first edge router, wherein said first  
3 signaling message contains a bundle identifier which is propagated without translation by  
4 each of said plurality of switches.

1 12 (Original): The method of claim 11, wherein each of said plurality of virtual  
2 circuits comprises a switched virtual circuit.

1 13 (Original): The method of claim 6, wherein said acceptance message and said first  
2 signaling message are both formed according to a common format, wherein said common  
3 format contains a field which indicates whether a message comprises said acceptance  
4 message or said first signaling message.

1 14 (Original): The method of claim 13, wherein said format allows a range of virtual  
2 circuits to be specified, said format further allowing a plurality of traffic parameters to be  
3 specified for all of said range of virtual circuits, wherein said plurality of parameters in said  
4 first signaling message specify the desired parameters and said plurality of parameters in  
5 said acceptance message specify the accepted parameters.

1 15 (Original): The method of claim 14, further comprising sending a release message  
2 requesting release of another range of virtual circuits.

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1        16 (Currently Amended): A method of supporting the setting up of a plurality of  
2        virtual circuits between a first end system and a second end system, said plurality of virtual  
3        circuits being set up on a network connecting said first end system to said second end  
4        system, each of said plurality of virtual circuits terminating at said first end system and said  
5        second end system, said method being performed in a device, said method comprising:  
6                receiving from said first end system a first signaling request requesting said plurality  
7        of virtual circuits to be set up.

1        17 (Original): The method of claim 16, wherein said method further comprises  
2        sending an acceptance message if said plurality of virtual circuits can be set up between said  
3        device and said second end system in response to said first signaling request alone.

1        18 (Original): The method of claim 17, wherein said method further comprises  
2        provisioning all of said plurality of virtual circuits before said sending.

1        19 (Original): The method of claim 17, further comprising provisioning fewer than  
2        said plurality of virtual circuits to said second end system before performing said sending.

1        20 (Original): The method of claim 19, further comprising:  
2                receiving a second signaling message requesting activation of at least one of said not-  
3        yet-provisioned virtual circuits comprised in said plurality of virtual circuits;  
4                completing provisioning of said at least one of said not-yet-provisioned virtual  
5        circuits; and  
6                sending a completion message indicating said at least one of said not-yet-provisioned  
7        virtual circuits have been activated.

1        21 (Original): The method of claim 20, wherein said first signaling message contains  
2        a plurality of parameters related to a range of virtual circuits comprised in said plurality of  
3        virtual circuits, said method further comprising:

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4                   storing said plurality of parameters associated with said range of virtual circuits; and  
5                   provisioning said range of virtual circuits using said plurality of parameters,  
6                   whereby said plurality of parameters are transmitted only once for provisioning said  
7                   range of virtual circuits.

1                   22 (Original): The method of claim 21, wherein said first signaling request and said  
2                   second signaling message are received in the form of ATM cells.

1                   23 (Original): The method of claim 22, wherein said device comprises one of said  
2                   first end system, said second end system and a switch in the path of said plurality of virtual  
3                   circuits connecting said first end system to said second end system.

4                   24 (Original): A device for setting up a plurality of virtual circuits between a first end  
5                   system and a second end system, said plurality of virtual circuits being set up on a network  
6                   connecting said first end system to said second end system, said device comprising:  
7                   an outbound interface coupled to said network;  
8                   a message construction block coupled to said outbound interface; and  
9                   a call control logic for causing said message construction block to construct a first  
10                  signaling message requesting said plurality of virtual circuits to be set up, and to send said  
11                  first signaling message on said network to said second end system.

1                   25 (Original): The device of claim 24, further comprising a signaling application  
2                   programming interface (API), said signaling API receiving a request for a group of virtual  
3                   circuits from an external application, and communicating said request to said call control  
4                   logic, wherein said call control logic causes said first signaling message to be sent in  
5                   response to said request.

1                   26 (Original): The device of claim 25, wherein said outbound interface sends said  
2                   first signaling message in the form of a plurality of asynchronous transfer mode (ATM) cells,  
3                   said device further comprising:

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4 a signaling ATM adaptation layer (SAAL) output block to encapsulate data generated  
5 by said message construction block to generate said first signaling message, said SAAL  
6 output block being coupled to said outbound interface.

1 27 (Original): The device of claim 24, wherein said first signaling message comprises  
2 a plurality of information elements, wherein a first information element is designed to  
3 request set up of a single virtual circuit comprised in said plurality of virtual circuits, and  
4 a second information element is designed to request set up of a second plurality of virtual  
5 circuits comprised in said plurality of virtual circuits, said device further comprising:

6 an inbound interface receiving on said network an acceptance message indicating that  
7 only said single virtual circuit is possible to be provisioned if any of a plurality of switches  
8 in a connection path between said first end system and said second end system is designed  
9 not to support said plurality of virtual circuits; and

10 a parser examining said acceptance message and forwarding said acceptance message  
11 to said call control logic.

1 28 (Original): The device of claim 27, wherein said second information element  
2 comprises a non-mandatory information element according to a specification, wherein  
3 non-mandatory information elements can be ignored by said plurality of switches according  
4 to said specification.

1 29 (Original): The device of claim 28, wherein said specification comprises one of  
2 user to network interface (UNI) and network to network interface (NNI).

1 30 (Original): The device of claim 24, further comprising an inbound interface  
2 receiving an acceptance message, said acceptance message indicating that a plurality of  
3 switches in a connection path between said first end system and said second end system have  
4 set up said plurality of virtual circuits.

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1        31 (Original): The device of claim 30, wherein said plurality of switches accept said  
2        plurality of virtual circuits but immediately provision fewer than said plurality of virtual  
3        circuits, wherein said call control logic causes said message construction block to send a  
4        second signaling message to activate at least one of a plurality of not-yet-provisioned virtual  
5        circuits comprised in said plurality of virtual circuits.

1        32 (Original): The device of claim 30, wherein said plurality of virtual circuits is  
2        treated as a group of virtual circuits, wherein said first end system and said second end  
3        system support a plurality of groups including said group, said device further comprising a  
4        memory storing a bundle structure associated with each of said plurality of groups, wherein  
5        said bundle structure stores information identifying the specific plurality of virtual circuits  
6        forming the corresponding group.

1        33 (Original): The device of claim 32, wherein said memory further stores a plurality  
2        of call reference structures and a plurality of per-VC structures,  
3        wherein each of said plurality of call reference structures maintains the state of a call,  
4        wherein signaling messages related to each group are received on a corresponding call, and  
5        wherein each per-VC structure stores information related to a plurality of call  
6        parameters accepted for a corresponding one of said plurality of virtual circuits.

1        34 (Original): The device of claim 33, wherein said device comprises a switch in said  
2        connection path, said memory storing a plurality of switch structures, wherein each of said  
3        plurality of switch structures stores a mapping of an identifier of each of said virtual circuit  
4        in inbound direction to another identifier of the virtual circuit in outbound direction.

1        35 (Original): The device of claim 33, wherein said first end system comprises an  
2        edge router, wherein said first signaling message contains a bundle identifier which is  
3        propagated without translation by each of said plurality of switches.

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1       36 (Original): The device of claim 30, wherein said acceptance message and said first  
2       signaling message are both formed according to a common format, whereinsaidcommon  
3       format contains a field which indicates whether a message comprises said acceptance  
4       message or said first signaling message.

1       37 (Original): The device of claim 36, wherein said format allows a range of virtual  
2       circuits to be specified, said format further allowing a plurality of traffic parameters to be  
3       specified for all of said range of virtual circuits, wherein said plurality of parameters in said  
4       first signaling message specify the desired parameters and said plurality of parameters in  
5       said acceptance message specify the accepted parameters.

1       38 (Currently Amended): An device apparatus for supporting the setting up of a  
2       plurality of virtual circuits between a first end system and a second end system, said plurality  
3       of virtual circuits being set up on a network connecting said first end system to said second  
4       end system, said plurality of virtual circuits terminating at said first end system and said  
5       second end system, said device apparatus comprising:

6            an in-bound interface receiving from said first end system a first signaling request  
7       requesting said plurality of virtual circuits to be set up.

1       39 (Currently Amended): The deviee apparatus of claim 38, wherein said deviee  
2       apparatus further comprises a call control logic receiving said first signaling message, said  
3       device apparatus sending an acceptance message if said plurality of virtual circuits can be  
4       set up between said device apparatus and said second end system in response to said first  
5       signaling request alone.

1       40 (Currently Amended): The device apparatus of claim 39, wherein said call control  
2       logic provisions all of said plurality of virtual circuits before sending said acceptance  
3       message.

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1        41 (Currently Amended): The device apparatus of claim 39, wherein said call control  
2        logic provisions fewer than said plurality of virtual circuits to said second end system before  
3        sending said acceptance message.

1        42 (Currently Amended): The device apparatus of claim 41, wherein said inbound  
2        interface receives a second signaling message requesting activation of at least one of said  
3        not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits, wherein  
4        said call control logic completes provisioning of said at least one of said not-yet-provisioned  
5        virtual circuits and then sends a completion message indicating said at least one of said not-  
6        yet-provisioned virtual circuits have been activated.

1        43 (Currently Amended): The device apparatus of claim 42, wherein said first  
2        signaling message contains a plurality of parameters related to a range of virtual circuits  
3        comprised in said plurality of virtual circuits, said device apparatus further comprising a  
4        memory storing said plurality of parameters associated with said range of virtual circuits,  
5        wherein said call control logic 550 provisions said range of virtual circuits using said  
6        plurality of parameters, whereby said plurality of parameters are transmitted only once for  
7        provisioning said range of virtual circuits.

1        44 (Currently Amended): The device apparatus of claim 43, wherein said device  
2        comprises one of said first end system, said second end system and a switch in the path of  
3        said plurality of virtual circuits connecting said first end system to said second end system.

1        45 (Currently Amended): A device for setting up a plurality of virtual circuits  
2        between a first end system and a second end system, said plurality of virtual circuits being  
3        set up on a network connecting said first end system to said second end system, said plurality  
4        of virtual circuits terminating at said first end system and said second end system, said  
5        device being located in a communication path between said first end system and said second  
6        end system, said device comprising:

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7 means for sending to said second end system a first signaling message requesting said  
8 plurality of virtual circuits to be set up.

1 46 (Original): The device of claim 45, wherein said first signaling message comprises  
2 a plurality of information elements, wherein a first information element is designed to  
3 request set up of a single virtual circuit comprised in said plurality of virtual circuits, and  
4 a second information element is designed to request set up of a second plurality of virtual  
5 circuits comprised in said plurality of virtual circuits, said device further comprising:

6 means for receiving an acceptance message indicating that only said single virtual  
7 circuit is possible to be provisioned if any of a plurality of switches in a connection path  
8 between said first end system and said second end system is designed not to support said  
9 plurality of virtual circuits.

1 47 (Original): The device of claim 46, wherein said second information element  
2 comprises a non-mandatory information element according to a specification, wherein non-  
3 mandatory information elements can be ignored by said plurality of switches according to  
4 said specification.

1 48 (Original): The device of claim 47, wherein said specification comprises one of  
2 user to network interface (UNI) and network to network interface (NNI).

1 49 (Original): The device of claim 41, further comprising:  
2 means for receiving an acceptance message, said acceptance message indicating that  
3 a plurality of switches in a connection path between said first end system and said second  
4 end system have set up said plurality of virtual circuits.

1 50 (Original): The device of claim 49, wherein said plurality of switches accept said  
2 plurality of virtual circuits but immediately provision fewer than said plurality of virtual  
3 circuits, said device further comprising:

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4 means for sending a second signaling message to activate at least one of a plurality  
5 of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

1 51 (Original): The device of claim 50, wherein said plurality of virtual circuits is  
2 treated as a group of virtual circuits, wherein said first end system and said second end  
3 system support a plurality of groups including said group, said device further comprising  
4 means for storing a bundle structure associated with each of said plurality of groups, wherein  
5 said bundle structure stores information identifying the specific plurality of virtual circuits  
6 forming the corresponding group.

1 52 (Original): The device of claim 51, further comprising:  
2 means for storing a plurality of call reference structures, wherein each of said  
3 plurality of call reference structures maintains the state of a call, wherein signaling messages  
4 related to each group are received on a corresponding call; and  
5 means for a plurality of per-VC structures, wherein each per-VC structure stores  
6 information related to a plurality of call parameters accepted for a corresponding one of said  
7 plurality of virtual circuits.

1 53 (Currently Amended): A device for supporting the setting up of a plurality of  
2 virtual circuits between a first end system and a second end system, said plurality of virtual  
3 circuits being set up on a network connecting said first end system to said second end  
4 system, each of said plurality of virtual circuits terminating at said first end system and said  
5 second end system, said device comprising:

6 means for receiving from said first end system a first signaling request requesting said  
7 plurality of virtual circuits to be set up.

1 54 (Original): The device of claim 53, wherein said device further comprises means  
2 for sending an acceptance message if said plurality of virtual circuits can be set up between  
3 said device and said second end system in response to said first signaling request alone.

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1 55 (Original): The device of claim 54, wherein said device further comprises means  
2 for provisioning all of said plurality of virtual circuits before sending said acceptance  
3 message.

1 56 (Original): The device of claim 54, further comprising means for provisioning  
2 fewer than said plurality of virtual circuits to said second end system before performing said  
3 sending.

1 57 (Original): The device of claim 56, further comprising:  
2 means for receiving a second signaling message requesting activation of at least one  
3 of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits;  
4 means for completing provisioning of said at least one of said not-yet-provisioned  
5 virtual circuits; and  
6 means for sending a completion message indicating said at least one of said not-yet-  
7 provisioned virtual circuits have been activated.

1 58 (Original): The device of claim 57, wherein said first signaling message contains  
2 a plurality of parameters related to a range of virtual circuits comprised in said plurality of  
3 virtual circuits, said device further comprising:  
4 means for storing said plurality of parameters associated with said range of virtual  
5 circuits; and  
6 means of provisioning said range of virtual circuits using said plurality of parameters,  
7 whereby said plurality of parameters are transmitted only once for provisioning said  
8 range of virtual circuits.

1 59 (Currently Amended): A computer readable medium carrying one or more  
2 sequences of instructions for causing a device to set up a plurality of virtual circuits between  
3 a first end system and a second end system, said plurality of virtual circuits being set up on  
4 a network connecting said first end system to said second end system, each of said plurality  
5 of virtual circuits terminating at said first end system and said second end system, said

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6 device being located in a communication path located between said first end system and said  
7 second end system, wherein execution of said one or more sequences of instructions by one  
8 or more processors contained in said device causes said one or more processors to perform  
9 the action of:

10 sending to said second end system a first signaling message requesting said plurality  
11 of virtual circuits to be set up.

1 60 (Original): The computer readable medium of claim 59, wherein said first  
2 signaling message comprises a plurality of information elements, wherein a first information  
3 element is designed to request set up of a single virtual circuit comprised in said plurality  
4 of virtual circuits, and a second information element is designed to request set up of a second  
5 plurality of virtual circuits comprised in said plurality of virtual circuits, further comprising:

6 receiving an acceptance message indicating that only said single virtual circuit is  
7 possible to be provisioned if any of a plurality of switches in a connection path between said  
8 first end system and said second end system is designed not to support said plurality of  
9 virtual circuits.

1 61 (Original): The computer readable medium of claim 60, wherein said second  
2 information element comprises a non-mandatory information element according to a  
3 specification, wherein non-mandatory information elements can be ignored by said plurality  
4 of switches according to said specification.

1 62 (Original): The computer readable medium of claim 59, further comprising:  
2 receiving an acceptance message, said acceptance message indicating that a plurality  
3 of switches in a connection path between said first end system and said second end system  
4 have set up said plurality of virtual circuits.

1 63 (Original): The computer readable medium of claim 62, wherein said plurality of  
2 switches accept said plurality of virtual circuits but immediately provision fewer than said  
3 plurality of virtual circuits, further comprising:

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4 sending a second signaling message to activate at least one of a plurality of not-yet-  
5 provisioned virtual circuits comprised in said plurality of virtual circuits.

1 64 (Original): The computer readable medium of claim 63, wherein said fewer than  
2 said plurality of virtual circuits corresponds to one virtual circuit such that only one virtual  
3 circuit is provisioned in response to said first signaling message.

1 65 (Original): The computer readable medium of claim 64, wherein said plurality of  
2 virtual circuits is treated as a group of virtual circuits, wherein said first end system and said  
3 second end system support a plurality of groups including said group, further comprising  
4 maintaining a bundle structure associated with each of said plurality of groups, wherein said  
5 bundle structure stores information identifying the specific plurality of virtual circuits  
6 forming the corresponding group.

1 66 (Original): The computer readable medium of claim 65, further comprising:  
2 maintaining a plurality of call reference structures, wherein each of said plurality of  
3 call reference structures maintains the state of a call, wherein signaling messages related to  
4 each group are received on a corresponding call; and

5 maintaining a plurality of per-VC structures, wherein each per-VC structure stores  
6 information related to a plurality of call parameters accepted for a corresponding one of said  
7 plurality of virtual circuits.

1 67 (Original): The computer readable medium of claim 66, wherein said sending, said  
2 receiving and each of said maintaining are performed in a switch contained in said  
3 connection path, further comprising:

4 maintaining a plurality of switch structures, wherein each of said plurality of switch  
5 structures stores a mapping of an identifier of each of said virtual circuit in inbound  
6 direction to another identifier of the virtual circuit in outbound direction;

7 mapping each identifier received in inbound direction to a corresponding identifier  
8 in outbound direction using said plurality of switch structures.

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1        68 (Original): The computer readable medium of claim 66, wherein said first end  
2 system comprises an edge router and wherein said actions are performed in said first edge  
3 router, wherein said first signaling message contains a bundle identifier which is propagated  
4 without translation by each of said plurality of switches.

1        69 (Original): The computer readable medium of claim 62, wherein said acceptance  
2 message and said first signaling message are both formed according to a common format,  
3 wherein said common format contains a field which indicates whether a message comprises  
4 said acceptance message or said first signaling message.

1        70 (Original): The computer readable medium of claim 69, wherein said format  
2 allows a range of virtual circuits to be specified, said format further allowing a plurality of  
3 traffic parameters to be specified for all of said range of virtual circuits, wherein said  
4 plurality of parameters in said first signaling message specify the desired parameters and  
5 said plurality of parameters in said acceptance message specify the accepted parameters.

1        71 (Original): The computer readable medium of claim 70, further comprising  
2 sending a release message requesting release of another range of virtual circuits.

1        72 (Currently Amended): A computer readable medium carrying one or more  
2 sequences of instructions for causing a device to support the setting up of a plurality of  
3 virtual circuits between a first end system and a second end system, said plurality of virtual  
4 circuits being set up on a network connecting said first end system to said second end  
5 system, each of said plurality of virtual circuits terminating at said first end system and said  
6 second end system, wherein execution of said one or more sequences of instructions by one  
7 or more processors contained in said device causes said one or more processors to perform  
8 the action of:

9            receiving from said first end system a first signaling request requesting said plurality  
10 of virtual circuits to be set up.

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1        73 (Original): The computer readable medium of claim 72, further comprising  
2 sending an acceptance message if said plurality of virtual circuits can be set up between said  
3 device and said second end system in response to said first signaling request alone.

1        74 (Original): The computer readable medium of claim 73, further comprising  
2 provisioning all of said plurality of virtual circuits before said sending.

1        75 (Original): The computer readable medium of claim 73, further comprising  
2 provisioning fewer than said plurality of virtual circuits to said second end system before  
3 performing said sending.

1        76 (Original): The computer readable medium of claim 75, further comprising:  
2 receiving a second signaling message requesting activation of at least one of said not-  
3 yet-provisioned virtual circuits comprised in said plurality of virtual circuits;  
4 completing provisioning of said at least one of said not-yet-provisioned virtual  
5 circuits; and  
6 sending a completion message indicating said at least one of said not-yet-provisioned  
7 virtual circuits have been activated.

1        77 (Original): The computer readable medium of claim 76, wherein said first  
2 signaling message contains a plurality of parameters related to a range of virtual circuits  
3 comprised in said plurality of virtual circuits, further comprising:  
4 storing said plurality of parameters associated with said range of virtual circuits; and  
5 provisioning said range of virtual circuits using said plurality of parameters,  
6 whereby said plurality of parameters are transmitted only once for provisioning said  
7 range of virtual circuits.

Reply to Office Action of August 05, 2005  
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Appl. No.: 09/976,004  
Attorney Docket No.: CSCO-010/4390

1        78 (New): The method of claim 1, wherein each of said plurality of virtual circuits  
2        comprises a asynchronous transfer mode (ATM) virtual circuit provided between said first  
3        end system and said second end system.